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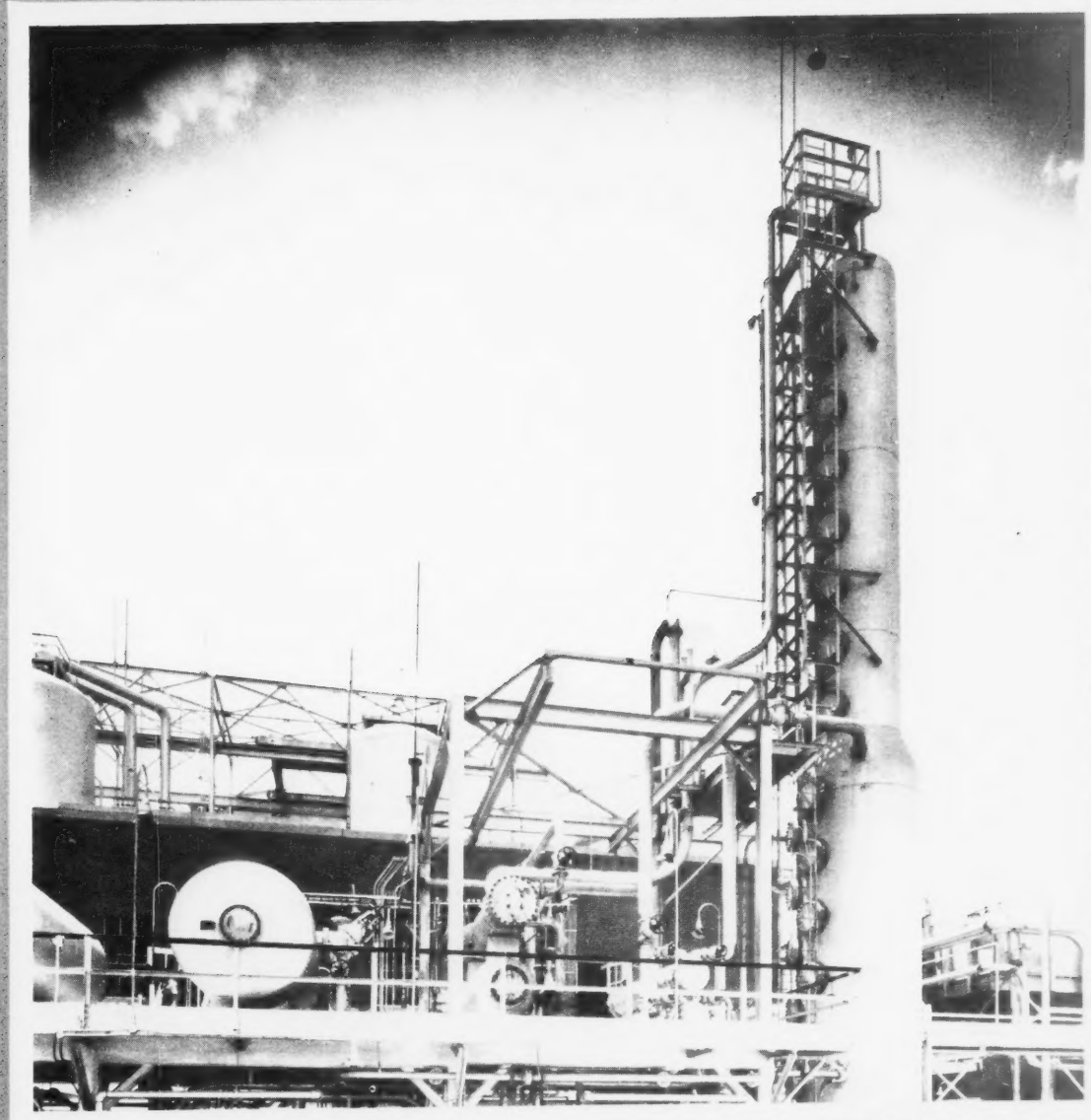
TECH ENGINEERING NEWS



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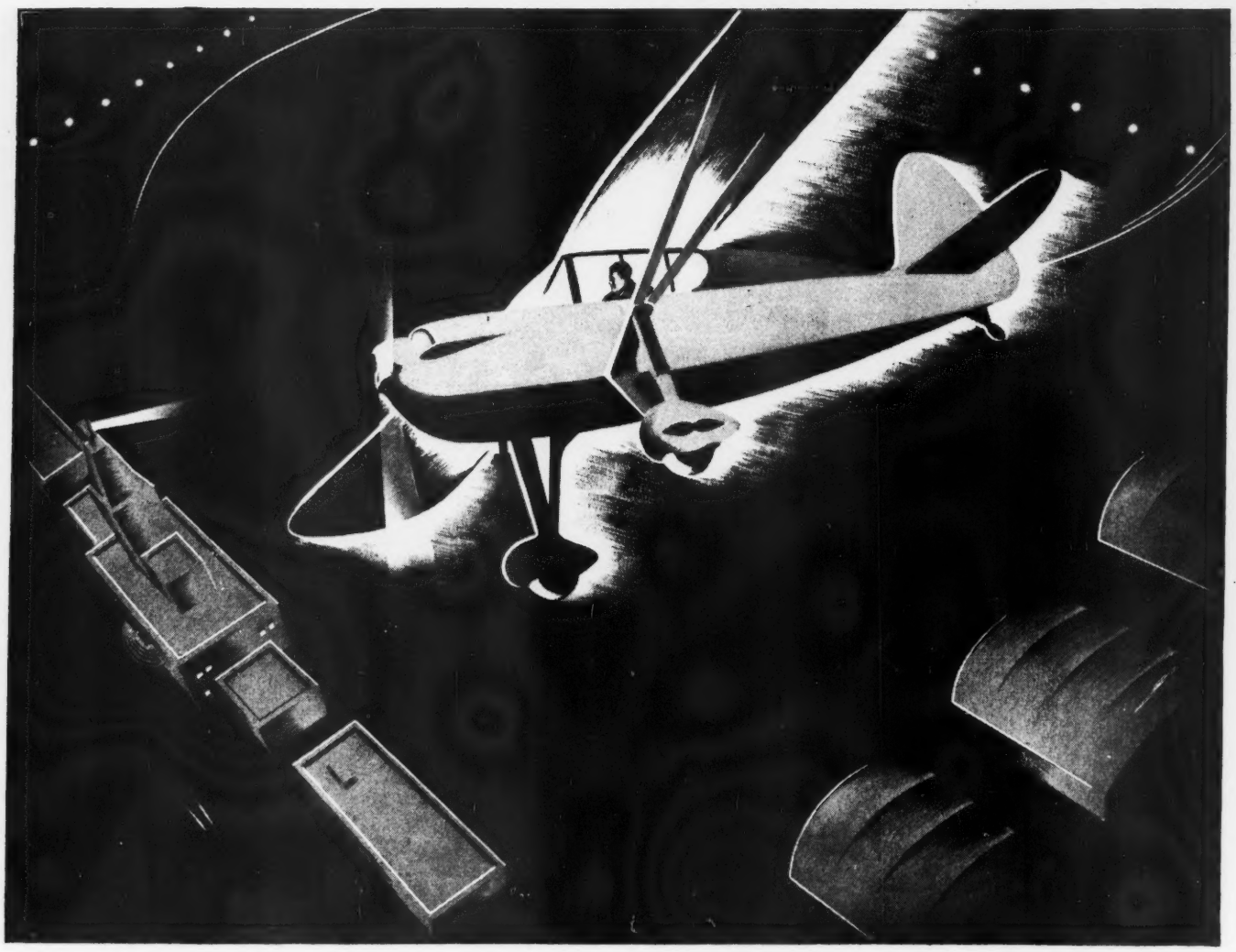

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MOLY

T.E.N. Photo

OUR COVER THIS MONTH shows the stabilizer column and auxiliary equipment used in the Houdry Process.

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ATHLETICS AT TECHNOLOGY

A SURVEY OF ATHLETIC OPPORTUNITIES FOR THE UNDERGRADUATE

ATHLETIC surveys at Technology are not new. We believe, however, that an unbiased survey that is not attempting to ground an original assumption upon fact is new. It is with this thought that the TECH ENGINEERING NEWS presents the results of their recently completed survey of athletics at Technology.

In approaching the subject of athletics at Technology, the question of freshman athletics is probably of major importance. The freshman's activities in sports his first year will probably determine the future of his participation in athletics. To determine the attitude of the freshman class towards athletics a questionnaire was submitted to them, reaching 484 men out of the total class of 595. The results of this questionnaire showed definitely that the present freshman class is interested in, and wishes to participate in athletics. In its present form, the system of physical training for freshmen requires all first year men to take physical training classes in the Walker Gymnasium if they are not registered in some recognized sport. If they are so registered, they must report to the sport three times a week to be exempt from P.T. periods. Of the men contacted 327 are at present substituting some sport for P.T. From this group only two men indicated they were dissatisfied and would like to return to regular P.T. classes. Of the 143 contacted men who are enrolled in P.T. classes at present, 23 said they were satisfied, and the rest chose some recognized sport as a substitute. In addition to the 327 taking sports and 143 taking P.T., 14 men indicated that they had obtained excuses from physical activity.

The question immediately arises of why, if approximately 95 per cent of the freshman class is in favor of athletic substitution, that there are 180 men regularly reporting for P.T. classes at present. The answer lies in the fact that to substitute a sport for P.T., men must report at inconvenient hours, the time that coaching is available.

The original large interest in sports among the freshman class does not carry through the four years the men remain at the Institute. Figures from the recognized sports operating under the supervision of the M. I. T. A. A. show that 274 sophomores, 195 juniors, and only 131 seniors are actively participating in sports. This is in some degree natural because of the increased scholastic work that a man must carry as he passes from class to class. Another serious effect, however, upon a man's participation in sports during his upperclass years is exerted by the P.T. classes his freshman year. Statistics show that of the 131 seniors now actively engaged in sports only 20 did not substitute a sport for P.T. their freshman year. Evidently, taking P.T. exerts a negative influence upon a man's interest and hence later participation in athletics.

Another indication of the large potential interest in sports at Technology is the large participation in intramural athletics, operated under the supervision of the Beaver Key Society. Of the 32 teams regularly entered in any Beaver Key Tournament practically all participate in at least one game. When one considers a sport such as touch football, where a relatively large number of men compose a team, it can be seen that many more men will participate in athletics when given sufficient opportunity than are now actively engaged in sports.

Even though there is a large student interest in sports, there are certain facilities that must be furnished by the parent institution before athletics are possible. At Technology certain sports are well equipped, notably track at present, and swimming upon completion of the new pool in the near future. We boast of one of the finest track fields in New England at present. Upon completion of the new pool a similar situation will exist

with swimming. This is not the case in other representative sports, however. For example, basketball, a sport having one of the finest records at Technology, reports that lack of equipment, floor space, and a sufficient number of coaches constitutes a serious handicap to the team. Fencing, also with a fine record, reports that varsity candidates must supply 90 per cent of their own equipment, while prospective freshmen must furnish all of their necessary supplies. Judging from the turnout for the Fall Tournament, tennis is one of the most popular sports with entering freshmen, yet there are but six tennis courts on the Institute's grounds.

This lack of facilities in many sports is not without reason, however. Sports are expensive and at present the Institute allots large sums of money for their maintenance. The undergraduate budget for sports at Technology shows that $5.80 per student is spent on athletics plus large amounts from the annual $60,000 general undergraduate fund. Even this is insufficient to supply all sports with adequate facilities. The expenses are allotted in several ways. In spite of our apparent lack of coaches, over $15,000 is spent on coaching every year, with 18 official coaches and five not so recognized. Through the M. I. T. A. A. sums from the sports fund are given for team trips, uniforms, and other necessities of the various teams. Upkeep of the various field houses claims another large share, costing about $11,000 this year. The sailing pavilion will claim approximately $6,000 this year, and the boathouse the same amount.

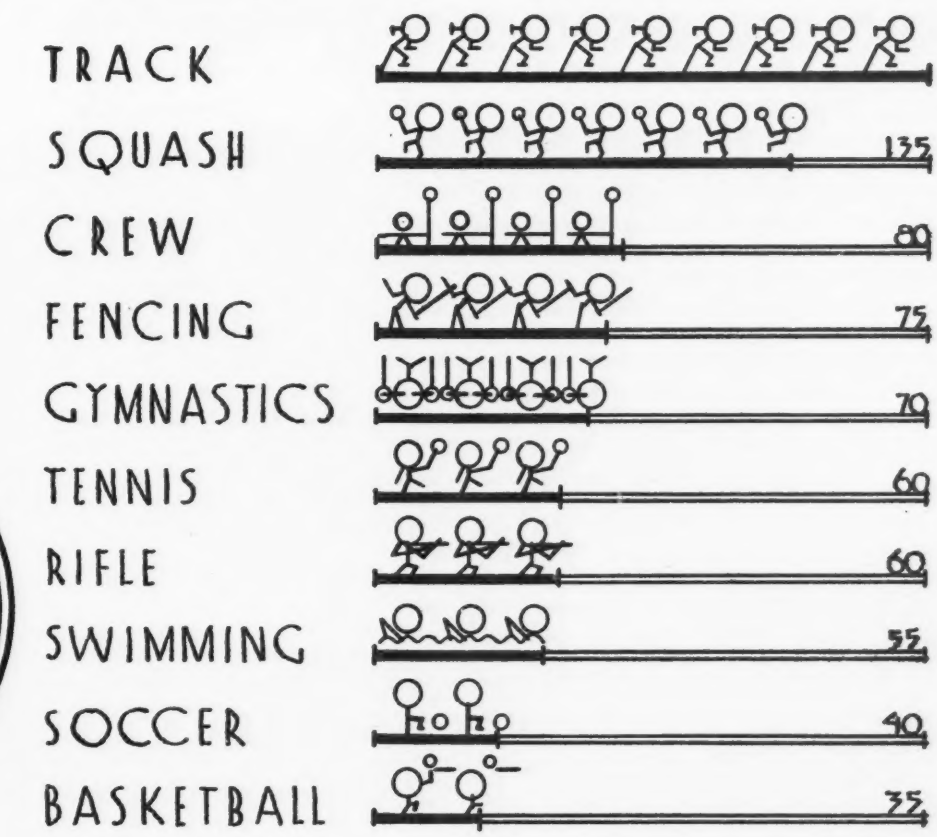
Permanent facilities offered in the various athletic buildings are: (1) a total of 2,325 locker spaces for students and 107 for visiting teams, officials and coaches, (2) seven squash courts in the Barbour Field House, (3) a small basketball court in conjunction with wrestling mats and a boxing ring in the gymnasium adjacent to the Barbour Field House, (4) complete equipment for track and field events in the new Briggs Field House, (5) the Walker Memorial Gymnasium providing space for the gymnastics team and for the fencing team, (6) the sailing pavilion, (7) the boathouse with equipment for the crew, (8) six tennis courts, (9) a small rifle and pistol range, (10) a field suitable for team sports such as lacrosse and soccer, and (11) the new pool, now under construction. There is a proposed rifle range to be built in the basement of this building.

From the reports of the various team managers concerning facilities and men in their respective sports it is obvious that most sports have insufficient room for all men that might possibly be interested in them. Certain sports, such as golf, are naturally limited in facilities due to their very nature, but others, which require a relatively small outlay of expense per man, such as lacrosse and soccer, are nevertheless still limited by insufficient funds. Many sports reported turning men away, even with the present limited interest in sports, while others indicated that many men became discouraged through lack of facilities and consequently lost interest.

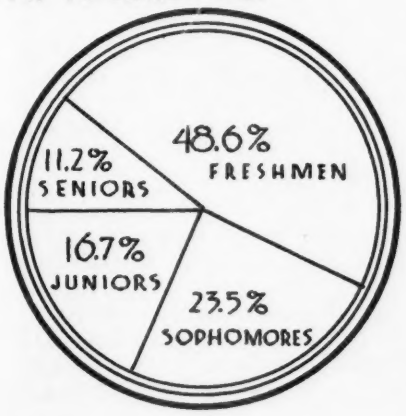
There is little question of the value of athletics to the college student. Sufficient to say that it has been generally agreed that athletic participation, both in teams and as an individual, has its own place in the general field of character development. At the present time about one third of the students at Technology are participating in recognized sports. The freshman ques-

(*Continued on page 168*)

COMPARATIVE NUMBERS OF PARTICIPANTS IN LEADING SPORTS AT M·I·T ONE FIGURE REPRESENTS 20 MEN



SPORTS REPRESENTATION BY CLASSES AT TECHNOLOGY



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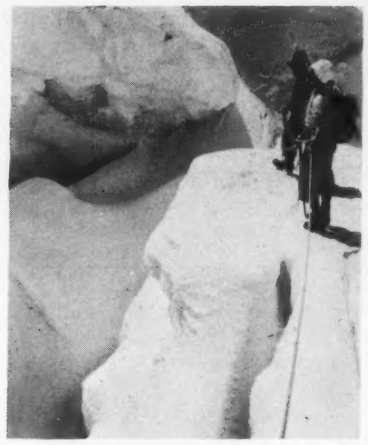
MOUNTAIN CLIMBING ON THE CONTINENT



Photographs by Hans Otto, '40

FROM TREE TO SKI

MODERN SKI-MAKING PRACTICE

By C. A. LUND

PRESIDENT OF NORTHLAND SKI MANUFACTURING COMPANY

THE modern ski of today is a far cry from the ski used only a few years ago. Today's streamlined boards are as different from their ancestors as one of the 1940 model cars compared with the Tin-Lizzy of 1916.

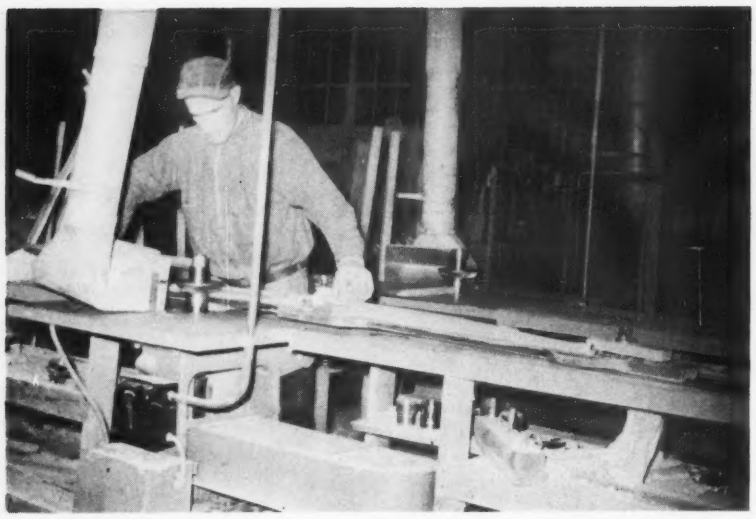
Modern high speed skiing has been made possible by the continuous efforts of the up-to-date ski maker to produce a ski which will perform under the most trying conditions encountered in the fast pace of today's skiing.

Let us take a look into the plant, which is the world's largest producer of high-quality skis and one of the most modern woodworking plants in the world, to watch the making of a ski from start to finish.

Far down south from Florida to Tennessee, where snow is a novelty, hickory, the finest material known for skis, is grown. The logs which produce ski material must meet certain specifications which are laid down by the ski manufacturer for whom the hickory is cut. They are selected "on the stump," that is, while the tree still stands, and only a small section of each tree, which is known as the "butt," is cut for ski lumber. Contrary to ordinary sawmill practice, the logs are not squared and then cut. As ski lumber must run strictly with the grain and since each log tapers to a certain degree, the planks or billets are cut parallel with the grain. This leaves a small, pyramidal section in the center which is discarded. The eight-foot-long billets, as the tough ski stock is called, are carefully piled in large stacks for preliminary drying immediately after they are cut. To protect the billets from too rapid drying, the ends are dipped in liquid paraffin to form an airproof cover which prevents the ends from cracking and splitting as they might do if they were permitted to dry without protection.

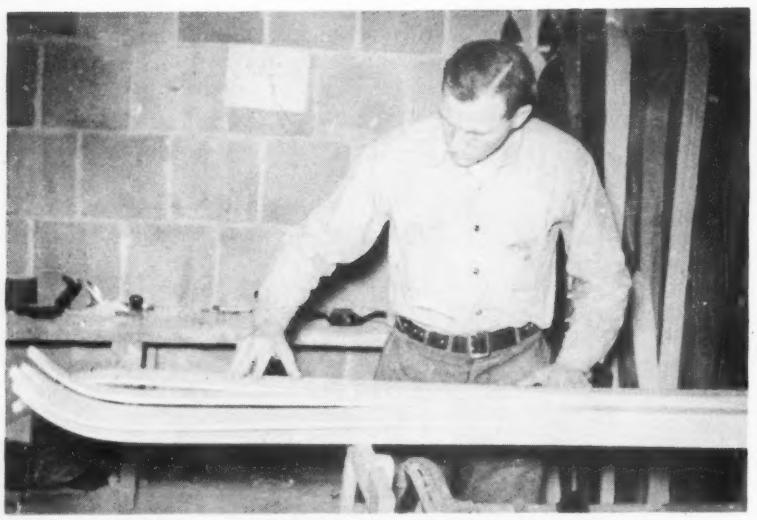
After this preliminary drying period is completed, the billets are shipped to the point of manufacture, where they are again stacked in piles for further seasoning. The moisture content of the wood is frequently checked during this period as the billets have to be dried to an exact pre-determined figure. It is extremely important in the manufacture of a good ski that the moisture content be brought down to, and held at, exactly the right percentage. The flexibility and elasticity of the skis depends to a great extent on the percentage of moisture retained in the wood.

Large pile of hickory stacked for seasoning



Rough Shaping

Straightening Skis



Close Inspection

Courtesy Northland Ski Mfg. Co.

When the moisture test proves that the billet is ready to be made into a ski, it is taken into the shop and planed on high-speed planers to provide two smooth surfaces from which all measurements can be taken. The next operation shapes the rough contour of the ski along the edge; and a single operation shapes the contour of the ski on a horizontal plane, leaving enough stock in each direction for further hand-shaping operations which are to follow later. These rough shaping operations are done on special machinery, which provides, by automatic adjustment, enough tolerance for the individual hand-shaping of the ski later on.

After the rough shaping has been completed, the ski is taken to the bending room where the bend and spring are permanently formed into the wood. The ski is placed in a pressure steam retort where the moist heat of the steam softens the wood so it can be bent easily. This process does not disturb the cellular structure of the wood, but the same cannot be said for all bending processes because the manufacturers of inferior skis sometimes subject the wood to dry heat rather than to moist heat. The moist heat process will keep a ski bent and in excellent shape over a long period of time.

After the skis have undergone this above-mentioned softening process, they are put on forms which have the exact contour of a bent ski. They are clamped on to these forms and then go through a further drying process under controlled atmospheric conditions.

After a period of time has elapsed, the skis are removed from the forms and have then the characteristic bend and spring of a high-quality ski. Short skis have less spring than long skis as they are usually bought by people somewhat lighter in weight, who do not depress the skis as much as a heavier person. The spring in a ski serves the purpose of keeping the ski on a level plane while the person stands on it. The ideal ski lies absolutely even on a level surface when a person weights it down. If a ski does not possess the necessary amount of spring, it sags in the snow under the weight of its rider, thus permitting only a small portion of the running surface to be in contact with the snow.

The ski is now ready for hand-shaping. Excess stock is removed on sanding drums, and the final shape of the ski is developed step by step. Workmen in these finishing departments must be highly skilled to perform the hand-shaping, sanding, and polishing, so that the skis will have accurate dimensions and proportions. At this point, the skis are matched into pairs. They are carefully weighed on accurate scales, and on a special jig the tensional pull on the ski tip is determined in pounds. Only those skis are paired whose weight, tension, and grain closely match.

This equalization is of extreme importance in the final quality of a pair of skis. A ski which does not flex exactly as its mate, which weighs a little more or less than its mate will never run steadily. It is natural that it is almost impossible to find two pieces of wood which will be absolutely identical in all points. However, the leeway permitted in branded and high-quality skis is extremely small as compared with the tolerance permitted by manufacturers of lower priced and inferior skis.

After the matching station the ski is hand-ridged first with a spoke shaver and then with a draw blade. This is probably the most intricate operation in the making of a ski. Workers must have a large amount of experience if they are to form a ridge which is not only beautiful, but which will permit the ski to flex true and even over its entire length. The same worker who ridges the ski also polishes the whole length of the ski

(*Continued on page 171*)

COOL LIGHT

FLUORESCENCE AIDS IN REDUCING LIGHTING COSTS

By C. L. DOWS, '12

EXECUTIVE ENGINEER, GENERAL ELECTRIC COMPANY

COOL light, a scientific dream since the days of the ancients, has always been the goal of lighting men. Today it is a reality. Cool light means high luminous efficiency, so the search for artificial illuminants to give the customer more light for the same current dollar has also given us cooler light.

Since Edison made the first "bottled" lamp in his tiny laboratory at Menlo Park in October, 1879, artificial light sources have continuously experienced increases in luminous efficiency and thus have progressed towards the goal of cool light. The fluorescent Mazda lamp is a result of the search for efficient gaseous-conduction sources. In addition to being a cool source producing only one quarter the radiant heat of filament lamps on a lumen basis, this lamp produces daylight at an efficiency several times that of former sources.

Fluorescent Mazda lamps in their present state are tubular sources which give off light from their entire surface. The lamps are made in four wattage sizes — 15, 20, 30, and 40; four lengths — 18, 24, 36, and 48 inches; and two diameters — one and one and a half inches. They are electric discharge devices which make use of ultraviolet energy to produce internal fluorescence. Here is how they work:

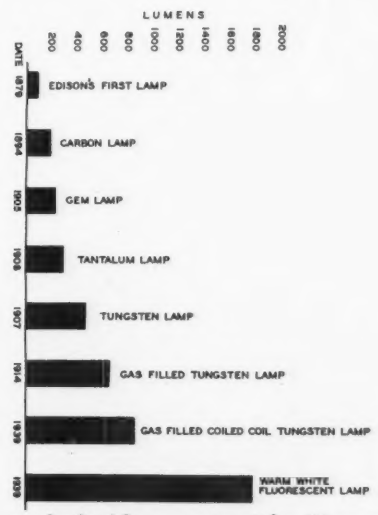


Chart depicts lamp output for 60 watts of lighting

The tubular bulb has two external contacts at each end to which are connected filament-type electrodes made of coiled tungsten wire. Like radio-tube electrodes, these filaments are coated with an active electron-emissive material. Chemicals which produce light when ultraviolet radiations strike them are coated on the inside of the bulb and a small drop of mercury and a bit of argon at low pressure are introduced. As in all electric discharge lamps, the electrodes are separated from each other with no apparent connection between them. And like all such sources, fluorescent lamps have negative resistance characteristics and require ballast equipment to limit the flow of current. A glow-switch starting device, for pre-

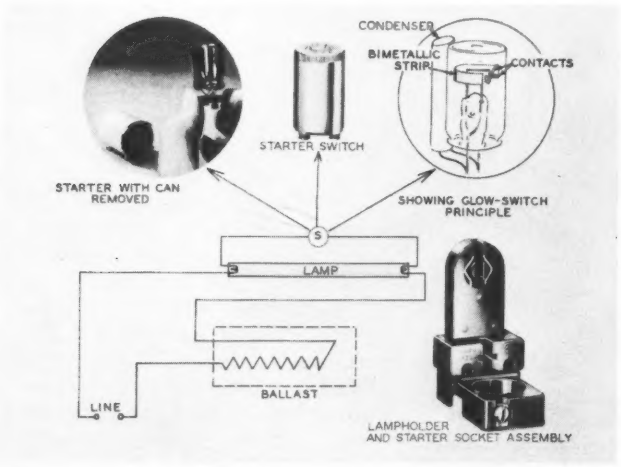
heating the lamp electrodes before discharge begins, was recently developed and can be mounted separately for each replacement.

The fluorescent ballast combines the functions of limiting the current and supplying sufficient starting voltage. The essential auxiliary equipment consists of (1) a choke coil to compensate for the negative resistance characteristic of the discharge, limit the current, and regulate the voltage to the proper value, and (2) a switch to permit heating of the electrodes before normal discharge begins. Two types of auxiliaries with built-in switches are available — magnetic and thermal, plus a complete line of ballasts for use with replaceable starters.

The starter (or built-in switch) completes the electrode-heating circuit on starting. When voltage is impressed, the switch first allows the electrodes to heat, then the contacts open and the choke gives an inductive voltage kick to the lamp, supplying the additional voltage sometimes needed to start the discharge.

A small percentage of the radiation from the discharge is in the visible spectrum of wave lengths characteristic of mercury-vapor discharge. The bulk of the radiation is, however, in the ultraviolet region. Of the input energy, 50 per cent is converted to radiation of wave length 2,537 angstrom units (one angstrom equals 10^{-8} centimeters), the mercury resonant radiation wave length. While some visible light of the characteristic mercury color has so far been produced, the real task is to utilize the ultraviolet radiation for the production of more visible light.

The principle of fluorescence has long been known. Certain chemicals, when subjected to radiation of the proper ultraviolet wave length, give off visible light. By placing these chemicals or "phosphors" within the tubular lamp, we can utilize the ultraviolet radiation from the discharge. The secret of the fluorescent lamp's efficiency lies in the ability of the phosphors to efficiently convert radiation of 2,537 angstrom units into light of a wave length varying with the particular chemicals selected. Of the several colors available (daylight, white, blue, green, gold, pink, and red) all but the daylight and white are produced by single phosphors having spectral characteristics which peak in their respective color regions. The daylight and white lamps use three specially selected phosphors to give a more nearly continuous spectrum. The result is a revolutionary new light source producing efficiently light of daylight quality — or color without the necessity of filters. The daylight lamp has a color temperature of



6,500° Kelvin which is the recognized value for white light given by the National Bureau of Standards.

All of the lamps except the gold and red colors appear white when unlighted, the exceptions being due to the additional coatings of colored pigments added to the gold and red phosphors to enhance their shades. The lamps all consume ten watts per foot of length.

All ballast equipment consumes energy and thus reduces the overall efficiency of the fluorescent system. Auxiliaries consume from 15 to 20 per cent as much energy as do the lamps themselves. The power factor of the fluorescent lamp itself is around 90 per cent. This is an "in phase" power factor, that is, not due to any leading or lagging of the current wave. As with other discharge sources, the power factor is due to wave distortion. The overall power factor of lamp and individual ballast or auxiliary is around 60 per cent lagging, lower, of course, because of the inductive reactance of the choke.

Good power factor is as important to the customer as it is to the utility. Just as low power factor means more expensive generation and transmission equipment and results in poorer utilization of such equipment, so it means to the power consumer a less efficient use of his wiring facilities.

A complete line of Tulamp ballasts having power factors of 95–100 per cent was recently announced. The Tulamp circuit consists of a "leading" leg and a "lagging" leg; the former using a series capacitor and the latter being inductively ballasted only. The result of the combination is a high overall power factor and minimizing of stroboscopic effect. It is also possible to correct power factor by supplying leading current at line voltage. Small and compact condensers are available for correcting either single lamps or groups of lamps. These capacitors are designed for location in the wireway or channel strip along with the auxiliaries. The group capacitors cost only about half as much per lamp

for correction and are much easier to wire in than individual capacitors.

If fluorescent lamps are to be used on direct current, resistance must be added to supply the needed ballast. The choke of the auxiliary will offer little impedance to direct current and alone cannot adequately ballast the discharge though it will still supply the voltage boost sometimes needed for starting. The resistance should be inserted in the line where it will be in series with the lamp and choke during normal operation. Commercial resistors or incandescent filament lamps of the proper ratings can be used.

One outstanding feature of the fluorescent lamp is its "cool light." Because these lamps are more efficient than filament lamps, there is less radiant energy and so less heating effect for the same light output. The footcandles obtained from the fluorescent lamps are, however, cooler than luminous efficiencies indicate. Actual measurements of radiant energy (or heating effect) showed that a 100-watt tungsten filament lamp gave four and a half times the heating effect per footcandle as the 15-watt daylight fluorescent lamp. The 500-watt filament lamp gave three and a half times the heating effect. Natural skylight through an open window gave about one-half the heating effect of the 15-watt daylight fluorescent lamp per footcandle. So it is seen that fluorescent lamps produce only about one-quarter the heating effect of filament lamps — a quality important to the air-conditioning industry.

The operation of fluorescent lamps depends on the maintenance of the mercury vapor arc and anything affecting the forming of mercury vapor will influence the operations of the lamps. Changes in external temperature will affect this vapor formation and influence light output. The lamps give their best performance when the bulb temperature is between 100 and 120°F., which is the bulb temperature under normal room temperature. At higher or lower temperatures the light output will be decreased. The light output of fluorescent lamps in a room at freezing temperature is only about a half of the light output at normal room temperature.

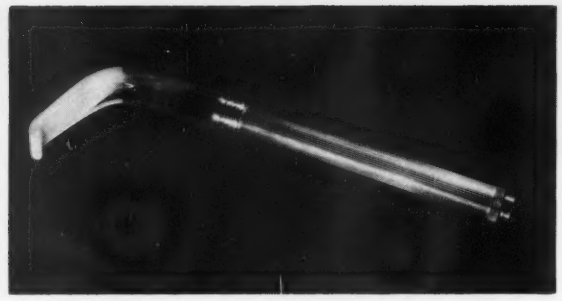
Fluorescent lamps offer a new tool for both decorative and general lighting. The bulb size, shape, diffusion, and distribution characteristics introduce new considerations to lighting practice. These factors have called for reflecting and fixture equipments of new designs, now commercially available. The fundamental principles of illumination remain unchanged, however. That is to say, our concepts of practice as regards acceptable brightness, reflected glare, distribution, contrasts, and shadows must be given the same consideration in applying fluorescent lamps as in the design of an incandescent filament lamp installation.

Some of the fields where fluorescent lamps offer distinct light advantages are: Theatre interiors, foyers, restrooms, and marquees, hotel dining rooms, lobbies and ballrooms, specialty shops, beauty parlors, art shops, and similar departments in large stores, art galleries, cocktail bars, drugstores, night clubs, and dance halls. Since the size and shape of fluorescent lamps allow freedom of application for creative lighting, architectural built-in lighting in many forms will be enhanced. A host of other applications for both general and supplementary light are made available.

To date, most fluorescent installations have used daylight lamps. This source produces standard white light with a high degree of fidelity and at an efficiency several times that of other daylight sources. It has thus served to enhance the displaying of colored cloths and merchandise. Daylight fluorescent lamps have been used in industry for color discrimination and some forms of color matching.

For the creative person interested in display and luminous advertising, fluorescent lamps offer many possibilities. Placed behind glass building block and configurated sheet glass, these lamps can produce sparkling color textures for both interior and exterior use. And for display lighting, the distinct appearance of the fluorescent colors makes possible many unique attention-drawing exhibits.

The fluorescent lamp will likely undergo considerable development in the future. Though it now has definite advantages for certain applications, it will supplement rather than supplant filament lamps. The fluorescent lamp can, however, be termed the greatest lighting development in years.



A medical instrument in which light from a bulb is "piped" around a sharp curve directly into the field of operation.

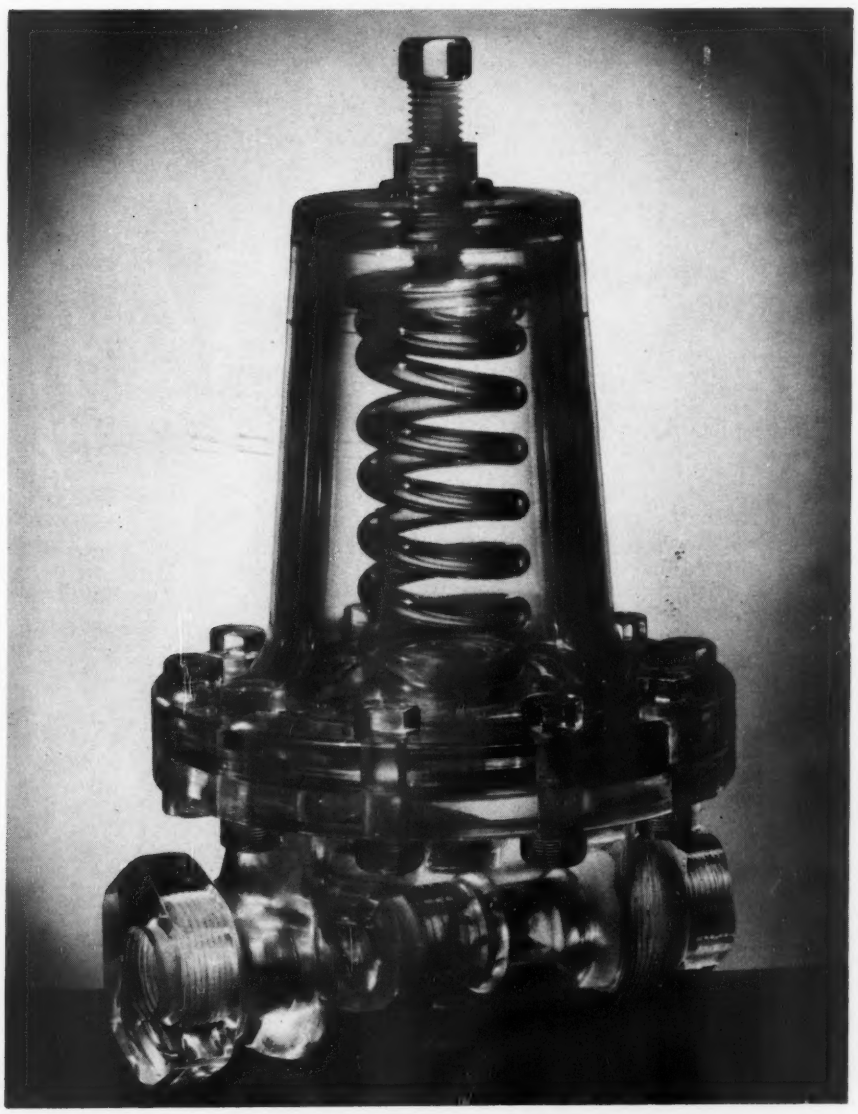
Below is a high-pressure valve encased in Plexiglas for demonstration purposes, while on the next page is shown a Plexiglas use in the aircraft industry.

FLEXIBLE GLASS

PIPING LIGHT WITH THIS NEW WORKABLE TRANSPARENT PLASTIC

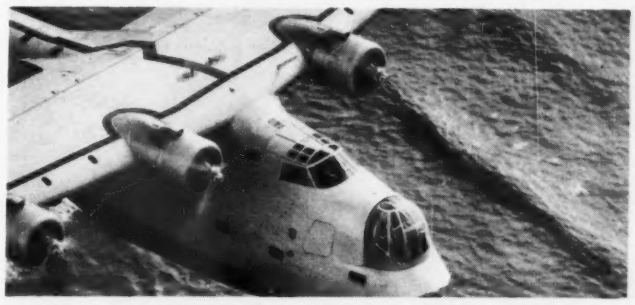
By D. S. FREDERICK

PLASTIC SALES MANAGER, RÖHM & HAAS COMPANY



ALMOST since silicate glass was first discovered, man has constantly sought to overcome its major fault —fragility. Little progress was made, however, until the development of modified natural products, like cellulose nitrate, fifty years ago. Since then, progress has been rapid, but it is still less than five years since the first commercial production of what is probably the best answer to date to this long search for flexible glass — the acrylic resin plastics.

The industrial development and application of the acrylic resins have been due primarily to the research of the late Dr. Otto Röhm of Darmstadt, Germany, who, with his collaborators, continuously worked with these materials for thirty-eight years after his original paper with von Pechmann in 1901. In 1927, Bauer, working in Röhm's laboratory, developed a process which made possible the plant production of small quantities of certain acrylic acid esters, but it was not



until 1935 that a solid thermoplastic resin, known as Plexiglas, was made commercially available.

When certain of the liquid esters are polymerized under the proper conditions and in special molds, Plexiglas, a crystal-clear, strong, hard solid is obtained. Because of its unusual properties Plexiglas has proven to be more than a substitute for glass. In the first place, it is clearer than glass. The most colorless crystal-clear solid known, its light transmission is so close to the theoretical maximum for a material of its index of refraction, that it is impossible to measure the difference. This clarity makes possible the "piping" of light around corners and sharp bends by a process of internal reflection. This phenomenon has been used to advantage in "cold light" medical and dental instruments which conduct light directly into the field of an operation. Recently a special material has been developed so that these instruments may now be sterilized by boiling without losing their shape.

Its light weight and high impact strength have made Plexiglas popular in the aircraft field. The permanence of its clarity also represents an improvement over other available substitutes for aviation purposes. Furthermore, it can be shaped to two- and three-dimensional curves to conform to the streamline contours of the plane and make important reductions in wind resistance. The direct result of this unusual combination of properties has been the increased use, especially in military planes, of large transparent sections which provide the important tactical advantages of clearer visibility over a wider range. The possibility of mounting Plexiglas in simple channels or drilling holes in it for bolting in lightweight frames has been an added factor in its favor.

Crystal-clear window display fixtures, spectacles, signs, tableware, and even furniture have been made of Plexiglas and it has found industrial application in the construction of transparent models for testing new designs, in shatterproof inspection windows, dial covers, safety goggles, etc. Since it is a true thermoplastic, Plexiglas may be shaped to any curve, simply by heating and bending. It can be sawed or carved like wood; it can be turned on a lathe, drilled or threaded like any soft metal; it can be cemented with liquid acrylic resin for colorless joints. Flat Plexiglas is expensive, but its versatility and ease of fabrication often enable finished Plexiglas pieces to compete with glass even in price.

These methods of fabrication are satisfactory when a relatively small number of simple pieces are planned, but for the production of a large number of identical pieces manufacturers usually turn to molding methods. For this purpose an acrylic resin molding powder known as Crystalite is prepared. The granules, at temperatures ranging from 250 to 300° F. and under pressures of 5,000 to 25,000 pounds per square inch, fuse into solid objects identical to the mold in shape and similar to Plexiglas in colorless transparency, weather resistance, and durability.

These properties have led to its wide use in the automotive field where edge-lighted speedometer dials, clocks, instrument panels, and radiator ornaments are molded in Crystalite. It can be used in molded reflector buttons of high optical efficiency, highway markers, and signs. Crystalite radio dials, cosmetic containers, pipe bits, trumpet mouthpieces, and lenses have also been made — all clearer than glass, more versatile, more durable.

The reason molding methods cannot be adapted to the production of small quantities is, of course, the cost of building molds which must be especially treated or plated to obtain highly polished surfaces. Progress in mold design, however, has been rapid and every day ingenious devices are cutting down assembly times, simplifying production methods, and making a thousand other economies which more than justify the cost of molds.

The development of molding materials has also been rapid. For example, Crystalite is now prepared in a number of types, each prepared to work at an efficient heating and cooling cycle under certain conditions of temperature and pressure. These latter conditions, of course, are determined by the condition to which the finished piece will be subjected; that is, a dial gauge to be used at 170° F. must be molded at higher temperatures than a radio dial which may never get as warm as 100° F. Crystalite to be used for compression molding must be prepared differently from powder to be used in injection molding where the material is heated to a semi-molten state before being injected under pressure into a cool mold. The area over which it must flow, the thickness of the section, the intricacy of the mold, and in injection molding, the width of the opening through which the material is forced, are among the other factors which will determine the type of Crystalite to be used.

At the present time, the determination of the best type of molding material and the optimum conditions of molding is entirely empirical. There are no formulae, no standards by which the molders can be guided. Even without benefit of these rules of thumb, however, molding can be an extremely efficient operation. For example, while pound for pound acrylic resin molding powder is many times more expensive to manufacture than glass, economic molding and intelligent mold design have in many instances made molded Crystalite actually cheaper than glass.

Thus rapid advances in molding technique may soon break down one of the last barriers which keeps man from complete success in his age-old quest for a glass substitute. Meanwhile, acrylic resin plastics are finding their own markets in applications where glass, because of its weight or fragility, cannot be used.

EDITORIALS

A CO-ED DORMITORY

There is a real place in the world for a girl who wants to develop her mind along technical lines and add her contribution, great or small, to the fields of science, engineering, or architecture. Technical fields are dominated by men, yet by entering one of them, a girl does not renounce her femininity. She may still marry and play a woman's part in the world, besides contributing to a technical field. A woman who has a responsible job in a field in which she is interested, either for a few years or for her life work, develops her personality and becomes a more interesting and valuable member of her community and her home.

Massachusetts Institute of Technology has always been open to women, and a few each year have taken advantage of the splendid opportunities the Institute has to offer. This year, there are over fifty regular women students at Tech. This group is decidedly in the minority, and yet it is sufficiently large to be important and well established. Only this year, the school authorities have appointed an Advisor of Women Students, and have provided the girls with a beautiful new suite of rooms, consisting of a modern lounge, finished in soft tones of pink and green, a large, well equipped kitchen and dinette, a quiet study room, and ample locker facilities for sixty-five girls. Many activities of the Institute, such as Dramashop, the Sailing Pavilion, and the various publications, welcome girls as members.

As girls have become an important group in the student body, it is only fair that some provision be made for housing them. At the present time, over half of the girls at the Institute, or about twenty-eight girls, are living away from home. These girls must find rooms at boarding houses, live alone or with another girl, and eat all their meals at restaurants or cook for themselves, which few Tech students find time to do properly. The ideal arrangement for the girls woud be a dormitory near Technology. There is an excellent location on the Charles River, one block beyond the Graduate House. on the corner of Danforth Street and Memorial Drive. This house should provide single rooms for about thirty girls, a common living room, a dining room and kitchen with a minimum of maid service, and a suite for a house mother. A tentative design for such a house has been drawn up, and the house could be built fairly reasonably. Such a dormitory would draw the girls into a closer companionship and provide a more normal and gracious background for living during the impressionable years, than the average room in a boarding house can afford. Living in a community of girls instead of in a boarding house room, during the years of mental strain that a Technology education demands, would help tremendously in making a girl a more worth-while member of her community and her home.

EDITH CAMERON,
President of Association of Women Students.

GOOD-BYE AND HELLO

Similar to the ringing out of the Old Year and ringing in of the New, so must the Managing Board of Volume XX pass out of an enjoyable active service to THE TECH ENGINEERING NEWS and give the future control and destiny of the magazine to the following competent men.

The Senior Managing Board of Volume XXI will consist of Warren J. Meyers, '41, General Manager; Donald D. Scarff, '41, Editor-in-Chief; and Harry J. Heimer, '41, Business Manager.

The Junior Managing Board is composed of three Associate Editors, Jerry Coe, '42, Carleton Jealous, '42, and Charles Speas, '42; Associate Photographic Editor, Jacques Shaw, '42; Treasurer, Bill Vallette, '42; Associate Treasurer, Henry Lemaire, '42; Personnel Manager, Charles Bein, '42; Circulation Manager, Warne P. Johnson, '42; Publicity Manager, William Wilcox, '42; Associate Art Editor, Dexter Wells, '42; and Advertising Manager, George Watters, '42.

The Freshmen have now been elected to the Editorial and Business Staffs. Those holding positions on the Editorial Staff are Trygue Blom, Leo Feuer, Dick Merritt, Harry Ottinger, Bert Picot, Donald Powers, Ronald Smith, D. R. Stevens, Harvey Freeman, Jack Spencer, and Jim Broderick. The Business Staff is composed of Frank Briber, Eliot Payson, Frank Clawson, Bob Schede, Morton Schultz, David Taylor, Kenneth Gifford, Robert Rumsey, and Bill Place.

THE IMPENDING CRISIS

Eighty years ago on the eve of the Civil War there appeared on the bookstands a new book entitled "The Impending Crisis" in which the author, in a very accurate prognostication, drew a picture of conditions in the North and South and pointed out that conflict was inevitable. Events of the past few months have produced so many "impending crises" that the populace has grown somewhat immune to the so-called inevitable. News from Washington, however, hints of a new and rapidly approaching crisis that is of vital importance to the engineer.

Various long periods of history have come to be known by the name of the substance most commonly used by man for his implements during that time. Hence, we find such names as the Stone Age, the Bronze Age, and the Age of Iron and Steel, the last named being the age in which we now live. Certain developments in the last decade, however, seem to indicate that we may be on the threshold of a new era. News reports from Washington give even more strength to

(*Continued on page 168*)

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JOSEPH P. BINNS
GENERAL MANAGER

THE Stevens HOTEL CHICAGO

EDITORIALS

(*Continued from page 166*)

the growing belief. It is known that iron and steel have been replaced to a large extent by alloys, but now, even before the world has become accustomed to alloys, another substance looms on the horizon — *plastics*.

In a recent government investigation, the vice-president of the Bakelite Corporation told a committee that a new method of employing plastics in building airplanes had been successfully developed. Probably the greatest advantage of the plastic material is that through its use (in the wings and fuselage) the plane might be constructed in less than one-twentieth the time it now takes. This fact has a double significance; the price of the finished airplane should be substantially less, and in case of war, planes could be turned out at a rate that was hitherto impossible.

The gradual but wide application of plastics in automobile parts, radio cabinets, household utensils, and countless other uses has only slightly alarmed those engaged in making metal products for the world. But now with this new and radical use for the plastic materials and the implication that the extension of uses will be wider in the future throws fear into the heart of the metal producer. Who can say but what we may one day sleep in plastic beds, work at plastic desks, and drive plastic automobiles. But most profound of all the effects will be the upheaval of our industrial civilization which will have to shift foundations.

ATHLETICS AT TECHNOLOGY

(*Continued from page 157*)

tionnaire, on the other hand, shows that approximately 95 per cent of the first-year students are interested in athletic participation. The intramural sports give further indication of potential student interest in athletics. The question naturally arises of how to arouse this dormant interest to a degree that will place the man in sports and, then, how to provide facilities for accommodating the increased number of men, not only freshmen, but upperclassmen as well.

It is apparent from the fact that only 20 of the present 131 seniors now participating in sports did not substitute some sport for freshman physical training that P.T. classes have a negative effect upon the man's interest, and hence future participation in athletics. Perhaps the most obvious and workable solution is to offer regular classes in all sports to freshmen during the same hours that the present P.T. classes are held. Thus the student would receive training in a sport with a minimum expense of time. This method would undoubtedly arouse interest in the various sports and result in a much greater percentage of men taking advantage of athletic participation during their four years at the Institute.

Even with but one third of the student body participating in athletics it has been pointed out that facilities are inadequate. Probably the most serious limitation, and this is true of all sports, whether otherwise well provided for or not, is the number of available coaches. There must be adequate coaching to arouse interest in the sport, this being especially true among the freshmen, and to insure the various candidates continued participation. Without going to the expense of hiring more regular coaches, the supply could be greatly increased by applying to the graduate students, many of whom are already helping in some sports. A large untapped reserve of potential coaches may be found among the group of graduate students who had athletic training before coming to Technology. The help that they could give would be invaluable in practically all of the sports.

At the present time rapid strides are being taken in the development of fixed facilities for athletics at Technology. The recent completion of the new Briggs Field House, the partially finished pool, and the plans for the gymnasium all show that steps are being taken to provide places for all possible candidates for athletics at Technology. These increased facilities, in turn, will

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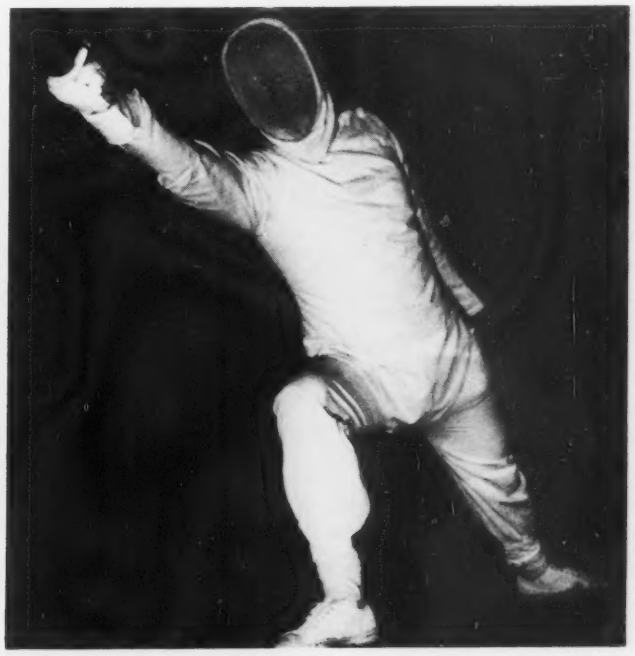
attract new men and arouse their interest in sports.

Thus, in conclusion, there are definite lacks in the training program of students, especially freshmen, in athletics. There are also definite lacks in the facilities for athletics. Steps are being taken to supply some of these needs, while others, such as the Physical Training program for freshmen and the question of securing adequate coaching, remain as yet unsolved. It is hoped that in the near future these difficulties will be solved, perhaps along the lines suggested above or by other means, and that athletics will take their rightful station in undergraduate life at Technology.

The Tech



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FROM TREE TO SKI

(Continued from page 160)

with sandpaper, first coarse and then fine, and after this process the ski is given its final inspection. Here again the ski is checked carefully. A ski might be of first-grade workmanship, but in this final inspection it might exhibit a minor flaw in the wood which had not been detected before the final sanding and polishing. Such a ski is not permitted to be branded as a first-grade ski.

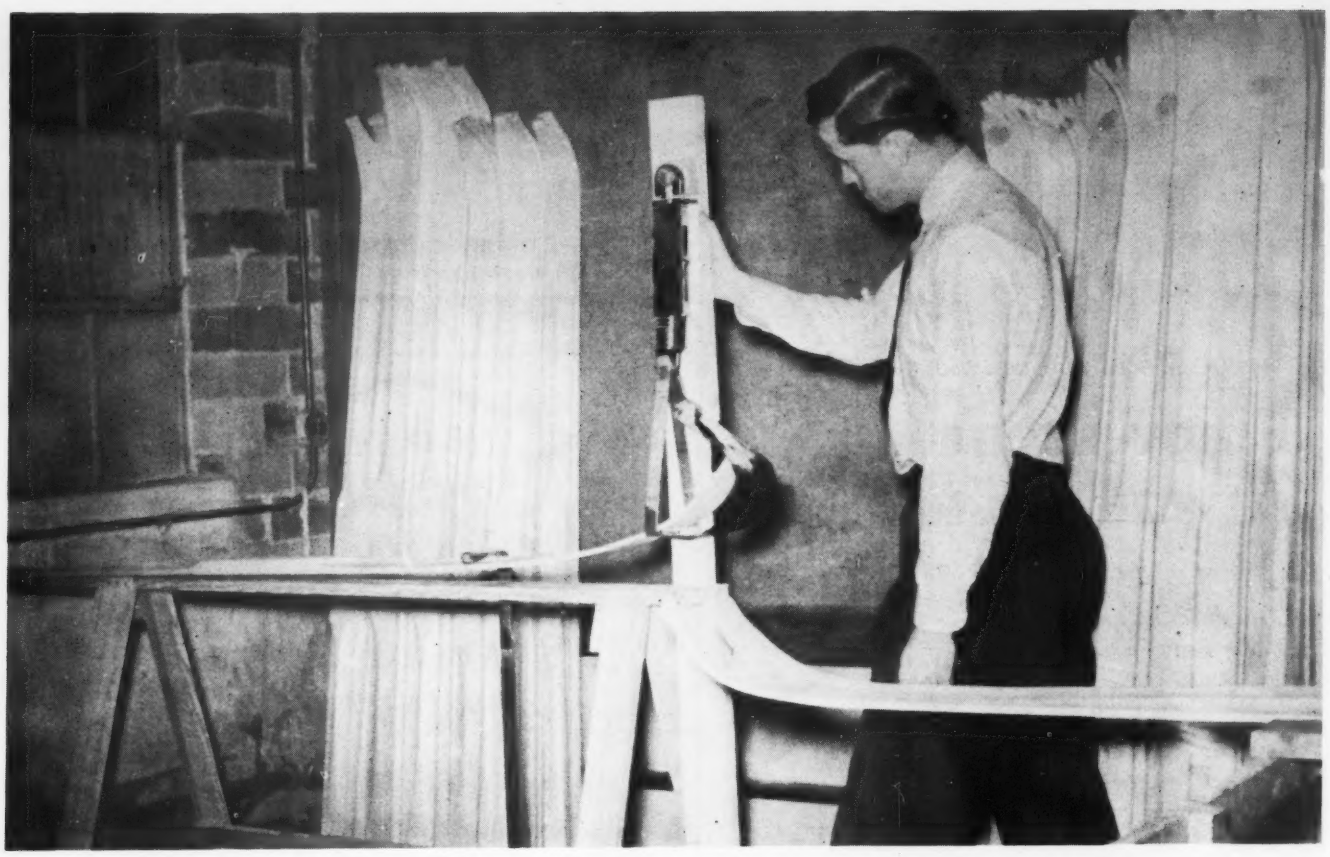
Here it might be well to say a few words about the importance of correct ski design. The purpose for which the ski is built naturally determines to a large extent the contour and the dimension of the finished product. Generally speaking, wider skis, with a larger taper from tip to center and from heel to center, are used in deeper snow. Skiers who, like many New England skiers, run primarily on hard packed or icy trails, prefer a narrower model with less taper, which will permit the whole edge of a ski to bear in a sharp turn. Lately combination models have been developed which are equally adapted to slalom and downhill running, and these so-called FIS models enjoy wide popularity. The design of this ski was brought about by the decision of the International Ski Federation not to permit the use of specialized skis in combination downhill and slalom competition. The word "FIS" stands for an abbreviation of the French Federation Internationale de Ski.

Let us now follow the first grade ski further on its way. After the final inspection of the ski it is brought into the finishing room where it is stained, sealed, lacquered, and polished into a lustrous, shining ski, which will warm the heart of any skier who lays eyes on it. The first step in finishing a high grade ski is the moistening of it with plain water to raise the grain. After the ski dries, the raised grain is sanded off with fine sandpaper, leaving a satin-smooth surface which will take stain without any further raising of grain. Next, stains of an organic nature are applied to the ski, giving it a rich golden or dark brown color. Some top grade skis are not stained at all but the natural wood color is allowed to show. Finally, the lacquer coatings are applied to the ski, often in different combinations, until the desired finish is obtained.

There is probably no other article used in any sport which takes such abuse as a pair of skis. Abrasion of ice and snow, moisture, vibration, and many other influences, wear and tear on the ski every time it is used. Sudden changes of temperature tend to crack and disrupt the surface film of lacquers, and for this reason the greatest care is used in order to protect the wood underneath from these influences. Lacquers are continuously tested for the amount of vehicle and solids they contain, and actual tests under gruelling conditions are conducted in order to assure a tough and permanent protection for the ski. Stains and lacquers must not discolor and must be impervious to the influences of both day and artificial light.

Before the last coat of lacquer has been applied, decalcomanias are attached to the ski and other identification marks are usually branded on the reverse side of the ski at this point. It is now ready for its last coat of lacquer and is then on its way to the markets.

Soon the ski will reach the skier, who will put it to



Testing the tension preliminary to matching skis into pairs

test and who will expect it to stand up under the most trying conditions. It should not be forgotten that skis have to take tremendous punishment, especially if they are used in high-speed skiing. Speeds ranging from fifty to seventy miles an hour are frequently reached by skiers in downhill races, while the sudden changes of slalom turns, twist and bend the ski continuously out of its original shape. Vibration of the ski on ice tends to loosen the bond in the wood fibre and this sometimes causes unexpected breakage. Taking into consideration that skis at the tip are usually only a fourth to five-sixteenths inch thick, it is not surprising that they sometimes do break if overloaded in one way or other. However, it is surprising how well a good hickory ski will perform when treated properly. Many substitutions have been advocated for the hickory ski, but since the time of the Vikings no other material but wood has been as useful or has been as much a giver of pleasure as the modern hickory ski. At this point it should be mentioned that not only hickory is used in the manufacture of skis, but other hardwoods like maple are used at times. However, the majority of better skis are hickory because this wood seems to have all the qualities which are necessary for the production of the best skis.

Let us now recapitulate the characteristics of a good ski. In three points it must show perfection. First, material must be above any criticism; second, workmanship must show care and painstaking labor which is characteristic of superior craftsmen; and finally, the design must make the skier feel that he rides wooden wings and not just two bent planks of wood.

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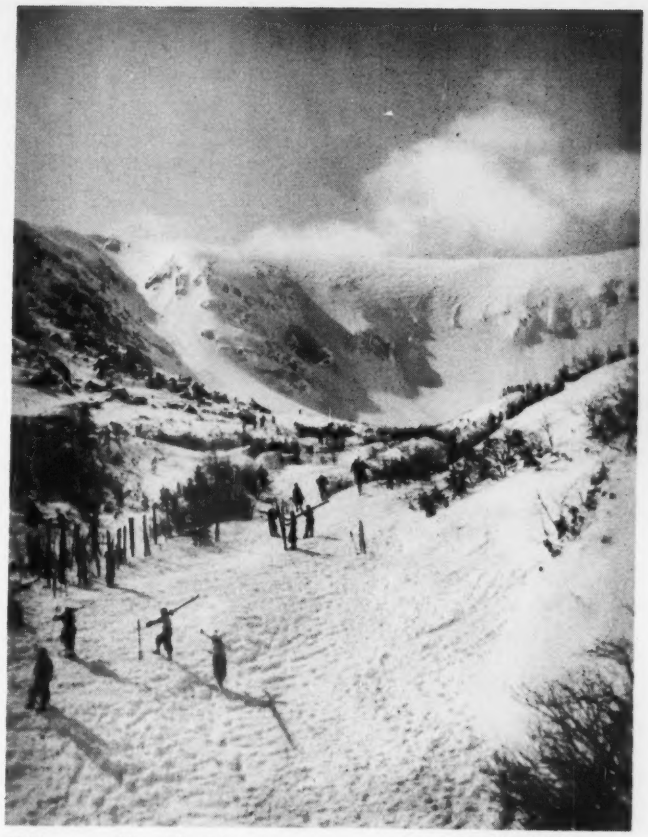

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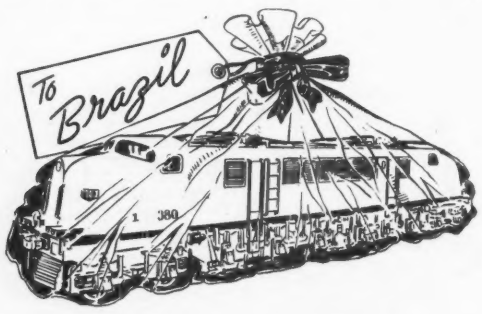
TO most people, the mailman is a fellow who rings the doorbell or toots a whistle or stops at roadside boxes. But to Rear Admiral Byrd and his expedition the mailman is a chap thousands of miles away.

The Admiral's mail, you see, is delivered by one of General Electric's world-famous short-wave stations at Schenectady, just as was done for the two previous Byrd expeditions. The letters are read from WGEO every other Friday, 11 to 11:45 p.m., EST, under the direction of station manager Eugene S. Darlington, Oregon State ex-Test man, and John R. Sheehan, Union '25, program manager.

A General Electric all-wave receiver on both the *Bear of Oakland* and the *North Star*, the party's ships, are the actual mailboxes. They will later be installed at the expedition's two camps. WGEO's mailman invites friends and relatives to send messages to the Byrd Antarctic Mailbag, General Electric, Schenectady, N. Y., for transmission to the expedition. Fifty words is the maximum.



PRIZE PACKAGE

FAME is nothing new to Brazil. She is not only the world's leading coffee grower, but also the largest state in South America, being 250,000 square miles bigger than continental United States.

Fame also is nothing new to General Electric's transportation department, headed by Guy W. Wilson, Penn State '23 and ex-Test-man. In all parts of the nation, the products of this G-E division can be seen in operation. Therefore, what is more natural than for these two parties to get together? They have — frequently. Their latest bit of co-operation is represented by four G-E direct-current locomotives, the world's most powerful, scheduled for delivery this month to the Paulista Railroad in Brazil. These 185-ton locomotives have a continuous rating of 4200 horsepower and a maximum speed of 93 miles per hour.

NAUTICAL MOTOR

DIFFERENT though the sailing ships of a century ago were from the express liners of today, the two have many things in common. Among their points of similarity is a need for emergency pumps, for water may sometime get where it doesn't belong because of a collision or other accident.

A far cry from the hand-operated pumps of old is the equipment which will be part of the S. S. *America*, the United States Lines' new 723-foot superliner, the largest ever built in American yards. Mounted 80 feet below the liner's boat deck, a G-E 40-horsepower motor will drive an Aldrich pump capable of emptying 900 gallons of flood water per minute. The motor and pump will empty all compartments through a system of piping reaching all parts of the ship. Other G-E equipment on the *America* includes 150 auxiliary motors and controls for such equipment as winches, refrigeration machines, and steering apparatus.

These applications are typical of the thousands of uses to which General Electric motors have been successfully applied. And an important reason for this success is the vast amount of motor-test data contributed by the young engineering college graduates on the G-E Test Course.

GENERAL ELECTRIC

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